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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/601,071	06/20/2003	Kyeong Jin Kim	042933/302927	8921

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ALSTON & BIRD LLP
BANK OF AMERICA PLAZA
101 SOUTH TRYON STREET, SUITE 4000
CHARLOTTE, NC 28280-4000

EXAMINER

ZHENG, EVA Y

ART UNIT

PAPER NUMBER

2611

SHORTENED STATUTORY PERIOD OF RESPONSE	MAIL DATE	DELIVERY MODE
3 MONTHS	03/06/2007	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

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Office Action Summary	Application No.	Applicant(s)	
	10/601,071	KIM, KYEONG JIN	
	Examiner	Art Unit	
	Eva Yi Zheng	2611	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 2/11/06.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-20 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-20 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Response to Arguments

1. Applicant's arguments filed 12/11/06 have been fully considered but they are not persuasive. Examiner has thoroughly reviewed Applicant's arguments but firmly believes that the cited reference reasonably and properly meet the claimed limitation as rejected.

Applicant's argument – Prior art Kim does not disclose selecting different metric calculator values for different channels in a MIMO communication system.

Examiner's response – Kim teaches data detection and joint channel estimation in MIMO communication system. It is well known that MIMO system comprises plurality of channels in both transmitter and receiver. Kim applies QRD-M data detection algorithm in the MIMO system, wherein "QRD-M algorithm is more attractive because it provides its user with the flexible performances with a *different value of M*" (page 1857, paragraph 3); and "we separately apply the QRD-M algorithm as a data detector" (page 1857, paragraph 5). Therefore, Kim applies different values of M associate with different channels in MIMO system, respectively. Kim and Shao in combination meet the claimed limitations.

Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the

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invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

3. Claims 1-20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kyeong Kim and Jiang Yue (Joint Channel Estimation and Data Detection Algorithms for MIMO-OFDM systems; applicant admitted prior art; AAPA) in view of Shao et al. (US 2004/0257978).

a) Regarding to claims 1 and 15, AAPA disclose in a Multiple-input, Multiple-output communication system in which transmit data is communicated to a receiving station upon a plurality of channels and received as receive data thereat, an improvement of apparatus for facilitating detection at the receiving station of the transmit data responsive to values of the receive data received at the receiving station, said apparatus comprising:

a selector selectably operable to select a metric calculator value (M) for each of at least a selected number of the plurality of channels (QRD-M algorithm in MIMO system, page 1857), the metric calculator values selected for at least two of the selected number of the plurality of channels differing from one another (page 1857, paragraph 3).

Kyeong Kim and Jiang Yue disclose that it is more beneficial and attractive to use QRD-M algorithm in MIMO system, but failed to teach a decoder that receive each metric calculator value selected by the selector.

Shao et al. disclose a MIMO-OFDM system comprise one or more sphere decoders (266(A) in Fig. 2). These decoders search for the closest distance in a QAM constellation ([0039]). Therefore, it is obvious to one of ordinary skill in art to combine the teaching of QRD-M algorithm by AAPA with the decoder of Shao et al. By doing so,

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reduce complexity and enhance the performance of interference canceller in MIMO-OFDM system.

- b) Regarding to claim 2, Shao et al. disclose that the decoder comprises a path estimator, said path estimator for estimating the values of the transmit data pursuant to a path-length estimation scheme ([0039]).
- c) Regarding to claim 3, Shao et al. disclose wherein said path estimator performs separate path-length estimations for each of the selected number of channels (266(A-Y) in Fig. 2).
- d) Regarding to claim 4, Shao et al. disclose wherein the path-length estimations performed by said path estimator pursuant to the path-length estimation scheme include estimation of path lengths of at least a selected proportion of possible path defined by possible values of the transmit data ([0039]).
- e) Regarding to claim 5, AAPA disclose wherein the selected proportion of the possible paths of which the estimation of the paths is performed by said path estimator forming said detector is related to the metric calculator value (QRD-M algorithm in MIMO system, page 1857).
- f) Regarding to claims 6 and 17, Shao et al. disclose wherein said path estimator estimates maximum likelihood paths for each of the selected number of channels ([0044-0047] and Fig. 4).
- g) Regarding to claim 7, AAPA disclose wherein the maximum likelihood paths formed by said path estimator are formed using a QRD technique upon a selected

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portion of the possible paths of which the estimation of the paths is performed (page 1857).

h) Regarding to claims 8 and 18, AAPA disclose wherein the selected portion is related to the metric calculator value selected by said selector (page 1857).

i) Regarding to claims 9 and 16, AAPA disclose wherein the metric calculator values selected by said selector are selected responsive to communication conditions upon the channels (page 1857-1860).

j) Regarding to claim 10, AAPA disclose wherein said selector is further adapted to received indications of the communication conditions upon the at least the selected number of the plurality of channels, and wherein the metric calculator values are selected responsive to the indications provided to the selector (page 1857-1860).

k) Regarding to claim 11, AAPA disclose wherein the complexity levels at which the decoding is performed by said decoder, responsive to the metric calculator values, is inversely related to the communication conditions such that the complexity levels increase when the communication conditions worsen (page 1857).

l) Regarding to claims 12 and 20, AAPA disclose wherein communication system operates pursuant to an OFDM (Orthogonal Frequency Division Multiplexing) scheme in which channels are defined upon channel subcarriers and wherein the metric calculator values selected by said selector are representative of communication conditions upon each of the channel subcarriers (page 1857).

m) Regarding to claim 13, AAPA disclose wherein the metric calculator values are maintained at a storage table, and wherein selection made by said selector is of

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selected one of the values maintained at the storage table (soft or hard algorithm, page 1857).

n) Regarding to claims 14 and 19, AAPA disclose wherein the metric calculator values are dynamically selected by said selector (page 1857, paragraph 3).

Conclusion

4. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Eva Y Zheng whose telephone number is 571-272-3049. The examiner can normally be reached on M-F, 7:30 AM to 5:00 PM.

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If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Chieh Fan can be reached on 571-272-3042. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Eva Yi Zheng
Examiner
Art Unit 2611

February 23, 2007


CHIEH M. FAN
SUPERVISORY PATENT EXAMINER